PATENT SPECIFICATION

(11) 1 215 655

DRAWINGS ATTACHED

1 215 655

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A5R 40X4 40X6

(54) IMPROVEMENTS IN OR RELATING TO SPRING-CLOSE—PINCH-OPEN CLIPS

(71) We, EDWARDS LABORATORIES, INC., a corporation organized under the laws of the State of California, one of the United States of America, of 624 Dyer Road, Santa Ana, State of California, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an improved parallel-jaw spring clip for surgical use and also to an applicator for placing the clip on a vessel or tissue, e.g., in the human body, when treating a patient.

In many surgical operations a considerable number of spring clips is required to occlude severed blood vessels and for other purposes. The most common type of spring clip has smooth-surfaced swinging jaws which are parallel when closed upon themselves but which are not parallel in the partially spread position they assume on a blood vessel. The lack of parallelism of the jaws sometimes makes it difficult to completely occlude the vessel to stop bleeding. Also, the lack of parallelism and the smooth, hard surfaces of the jaws create a tendency for the clips to slip off the vessel or other tissue.

Parallel-jaw clamps designed for other purposes are not adaptable to surgical use because of their size, weight and cost. Surgical clips must be small and light in weight. It is also highly desirable that they be sufficiently inexpensive to be used as disposable items. Sterilization is costly and in the case of parallel-jaw mechanisms, complete cleaning and sterilization cannot be accomplished without taking the clips apart. The taking apart and re-assembling of a large number of clips after an operation is obviously to be avoided.

The clip according to this invention accomplishes complete occlusion of a blood vessel, is light in weight, secure in its attachment to a vessel or other tissue and inexpensive to manufacture. It has two jaws which remain in parallelism throughout their opening and closing movements. The jaws are mounted on two telescoping members which are spring-closed and pinch-opened. One or both of the jaws may be a toothed hard jaw or one or both of the jaws may be equipped with a resilient soft jaw element, both types of jaws providing complete occlusion of blood vessels and secure retention thereon. Since the clips are disposable, there is no problem of cleaning and sterilizing the jaw mechanisms, and more reliable sterility is achieved.

A special applicator is provided for holding the clip open and placing it on a vessel or tissue. The clip and applicator have interengaging parts to hold the clip fixedly in a selected position relative to the applicator.

Objects of the invention are to provide an improved surgical clip, to provide a clip which subjects a vessel to minimum torque and distortion for occlusion, to provide a clip having parallel jaw movement, to provide a parallel-jaw spring clip which is compact, light in weight and well balanced, to provide a clip which is spring-closed and pinch-opened, to provide a clip having either hard or soft jaws or a combination of hard and soft jaws, to provide a good-quality clip of the type described which may be inexpensively constructed of plastics parts and used as a disposable item, and finally to provide an applicator which will hold the clip in a plurality of selected positions.

According to the present invention there is provided a spring-close-pinch-open clip for clamping objects, comprising a barrel

having a radial jaw on one end thereof, said barrel having a longitudinal slot extending from its opposite end to said jaw and there being in said barrel a hollow plunger having a radial jaw on one end thereof slidable in said slot; spring seats in the respective opposite ends of said barrel and said plunger; and a compression spring extending through both said barrel and said plunger and in contact with said seats.

For a beter understanding of the invention and to show how the same may be carried into effect, reference will now be made by way of example to the accompanying drawings, in which:—

Figure 1 is a side view of a hard-jaw clip, punched to open position,

Figure 2 is an enlarged view with parts in section, showing the clip in closed position on a blood vessel,

Figure 3 is a fragmentary top plan view of the clip,

Figure 4 is a view taken on the line 4-4 in Figure 2,

Figure 5 is a side view of a clip having one hard jaw and one soft jaw,

Figure 6 is a view taken on the line 6-6 in Figure 5,

Figure 7 is a side view showing a clip in the grasp of an applicator,

Figure 8 is a plan view of Figure 7,

Figure 9 is an enlarged detail view taken on the line 9-9 in Figure 8, and

Figure 10 is an enlarged detail view taken on the line 10-10 in Figure 9.

Referring first to Figure 2, opposed jaws 10 and 11 are moulded integrally with the inner ends of two telescoping members 12 respectively. Member 12 may be referred to as a plunger and member 13 a barrel for the plunger. The hollow plunger 12 is received within the barrel 13 and the latter is provided with a longitudinal slot 14 through which the jaw 10 projects in parallelism with jaw 11. Slot 14 prevents the two jaws from rotating out of alignment with each other, and the sliding fit between the plunger 12 and barrel 13 prevents the outer ends of the jaws from spreading apart on a clamped object.

A cap 15 is secured in the lower end of plunger 12 after the plunger has been inserted in the upper end of the barrel as shown. The parts 10, 11, 12, 13 and 15 are preferably made of a suitable plastic.

A metal compression spring 20 is contained within the plunger and barrel and seated on cap 15. A plastic cap 21 having a spring guide pin 22 is secured in the upper end of barrel 13. The upper end of spring 20 seats against cap 21 to urge the jaws 10 and 11 toward closed position. The jaws are separated by manually or otherwise pinching the caps 15 and 21 as shown in Figure 1. The caps form pinch grips for convenient grasp between the fingers. Barrel 13 is preferably equipped with a projection or extension 23, preferably having an opening or aperture 24 for tying the clip to a support, if desired.

Figure 2 illustrates how a vessel V is occluded by the parallel action of the jaws 10 and 11. When conventional clip jaws open with a pivotal movement, they are not in parallelism in clamped position on a vessel whereby one side of the latter may be damaged by pinching it excessively hard in order to completely occlude the lumen of the vessel. With the inventive parallel-jaw arrangement, occlusive pressure is minimized and it is uniform across the vessel with minimum distortion thereto. Teeth 25 tend to resist slippage of the jaws on the vessel. The parallel relation of the jaws in clamped position produces no forces tending to cause the clip to slip off the vessel.

When conventional jaws are not parallel in clamped position, a wedging action results, producing a component of force on the vessel in a direction away from the vertex of the angle between the jaws. The present clip, in contradistinction, is not only inherently stable on a clamped object but it is afforded means of positive retention through teeth 25.

The embodiment shown in Figures 5 and 6 is the same as the embodiment just described except that the lower jaw 11a is equipped with a rubber soft jaw element 30. Teeth 25 on the upper jaw are arranged along opposite sides of the jaw leaving a hollow or channel 31 extending between the two rows of teeth. Soft jaw element 30 deflects the vessel into channel 31 to aid in accomplishing complete occlusion of the vessel with minimum jaw pressure, as shown in Figure 6. However, the upper jaw 10 may also be equipped with a soft jaw element 30 to provide a clip having two soft jaws, if desired.

End caps 15 and 21 are provided with conical depressions 40 and radial notches 41 to cooperate with a special clip applicator 45 as shown in Figures 7 to 9. Applicator 45 is a scissors-type clamp having a jaw 6 integral with a handle portion 47 and a jaw 48 integral with a handle portion 49. These two members are pivitally connected together at 50 and the handle portions are equipped with a ratchet locking device 51.

Each jaw member 46 and 48 has at its extremity a conical projection 55 to fit conical depressions 40 in the respective caps 15, 21 of the clip, and a wedge-shaped fin 56 radial to the projection 55 to engage one of a plurality of radial notches 41 in said depressions 40. Thus,

the clip may be held in any one of a number of discrete angular positions relative to the applicator as shown in solid and broken lines in Figure 8. The engagement of fins 56 in notches 41 prevents rotation of the clip in the applicator 45. Ratchet 51 holds the clip in open position as shown in Figure 7 until it has been applied to a vessel, and the ratchet released by the operator.

WHAT WE CLAIM IS:—

1. A spring-close-pinch-open clip for clamping objects, comprising a barrel having a radial jaw on one end thereof, said barrel having a longitudinal slot extending from its opposite end to said jaw and there being in said barrel a hollow plunger having a radial jaw on one end thereof slidable in said slot; spring seats in the respective opposite ends of said barrel and said plunger; and a compression spring extending through both said barrel and said plunger and in contact with said seats.

2. A clip as claimed in claim 1 and further comprising an apertured extension one one side of said barrel.

3. A clip as claimed in claim 1 or 2, wherein said seats comprise caps secured on said ends of the barrel and the plunger.

4. A clip as claimed in claim 3, wherein said caps have means engageable by an applicator for preventing relative rotation between the applicator and the clip.

5. A clip as claimed in claim 4, wherein said means for preventing relative rotation includes an external conical depression in at least one of said caps and at least two radial notches adjoining said depression.

6. A clip as claimed in any one of claims 1 to 5, wherein at least one of said jaws has a soft, compressible clamping surface.

7. A clip as claimed in any one of claims 1 to 5, wherein one of said jaws has teeth to grip the clamped object.

8. A clip as claimed in claim 7, wherein the other jaw has a soft, compressible clamping surface.

9. A clip as claimed in claim 7, wherein both jaws have teeth to grip the clamped object.

10. A clip as claimed in any one of claims 1 to 9, wherein said barrel and said plunger constitute a pair of telescoping members, said jaws being substantially parallel with each other and said spring interconnecting said members to close said jaws against each other, and wherein the clip further comprises a pair of pinch grips on said members for opening said jaws.

11. A clip as claimed in claim 10 as appendant directly or indirectly to claim 4, wherein said pinch grips are formed by said caps and have therein said means for preventing relative rotation between the applicator and the clip proper.

12. A clip as claimed in claim 5 or any one of claims 6 to 11 as appendant directly or indirectly to claim 5, wherein both said caps have external conical depressions and the depression in one cap is oppositely directed with respect to that of the other cap.

13. A clip as claimed in claim 4 or any one of claims 5 to 11 as appendant directly or indirectly to claim 4, in combination with an applicator having a pair of jaws, and further comprising clip engaging means on the applicator jaws arranged to fit said means for preventing relative rotation.

14. A clip as claimed in claims 12 and 13, wherein said clip engaging means includes projections on said applicator jaws, arranged to enter said conical depressions, and radial fins on said projections each arranged to enter one of said notches.

15. A clip as claimed in claim 13, and further comprising adjustable means on said applicator arranged for locking said applicator jaws in any position.

16. A spring-close-pinch-open clip for clamping objects substantially as hereinbefore described with reference to Figures 1 to 4, or 5 and 6 of the accompanying drawings.

17. A spring-close-pinch-open clip for clamping objects in combination with an applicator tool, substantially as hereinbefore described with reference to Figures 7 to 10 of the accompanying drawings.

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2 SHEETS

COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale.
SHEET 1

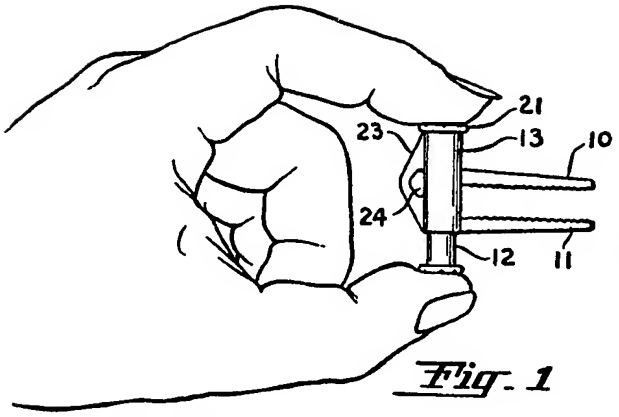


Fig. 1

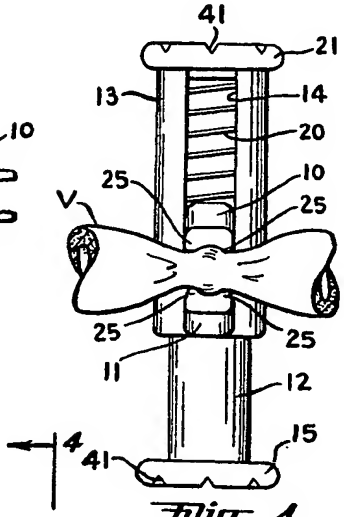


Fig. 4

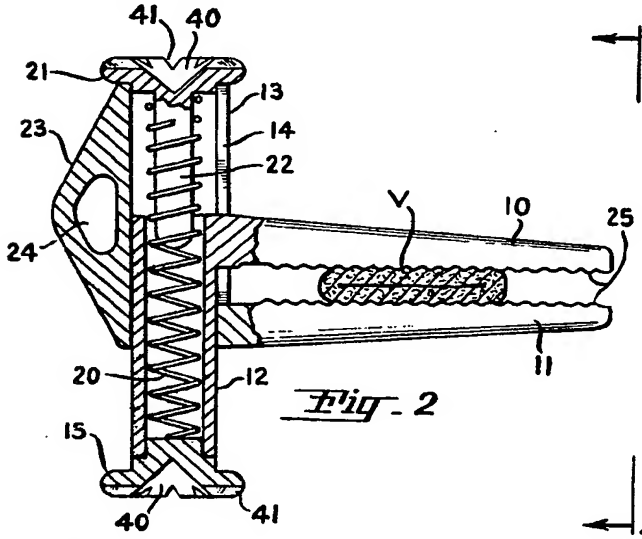


Fig. 2

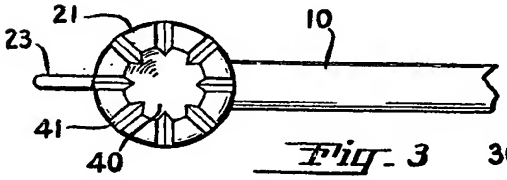
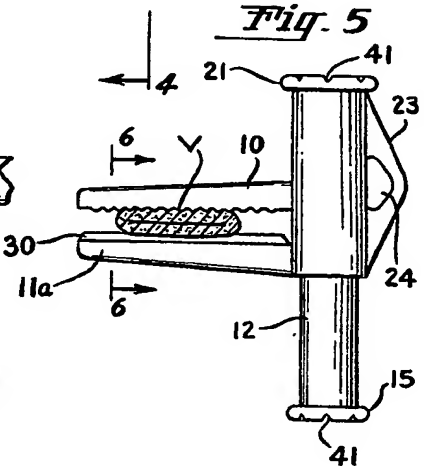


Fig. 3

Fig. 5



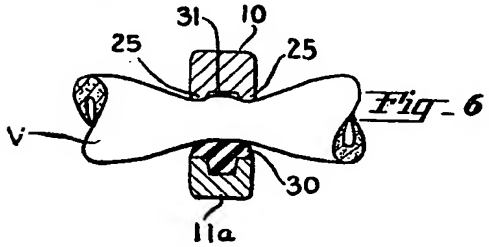


Fig. 6

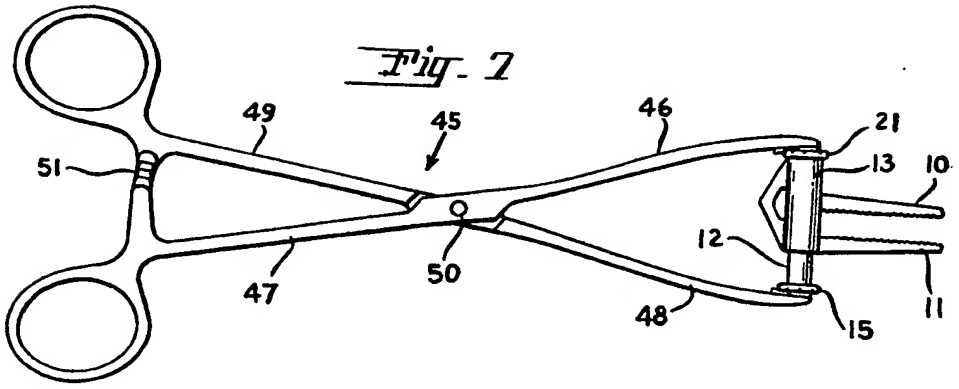


Fig. 7

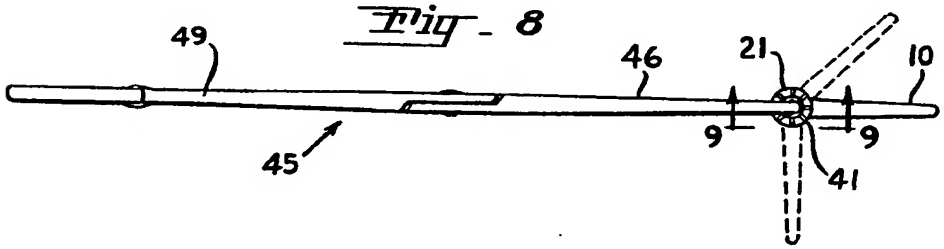


Fig. 8

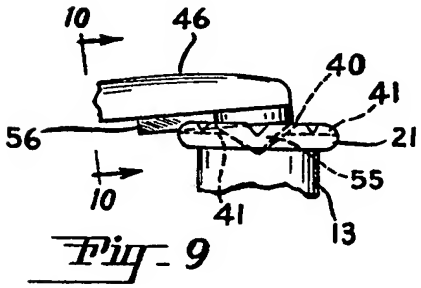


Fig. 9

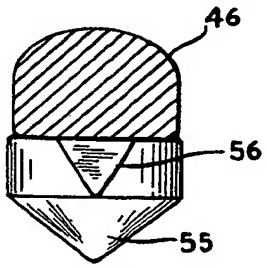


Fig. 10